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PRELIMINARY FORECASTS AND PROJECTIONS FOR 1987
ALASKA SALMON FISHERIES

Edited by
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February 1987

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Juneau, Alaska

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ABSTRACT

More than 127 million salmon were taken by commercial fishermen in Alaska in 1986, the fourth largest salmon harvest in history. This is the seventh consecutive year that Alaskan salmon harvests have exceeded 100 million fish. The ex-vessel value of the 1986 salmon harvest was approximately $404 million dollars.

The 1986 salmon harvest was weaker than pre-season forecasted catch of 138 million. This was due to weaker than anticipated pink salmon returns to northern Southeastern, Prince William Sound, Kodiak, and Western Alaska. However, sockeye salmon returns were very close to those forecasted, and pink salmon returns to southern Southeastern were much stronger than forecasted.

The projected 1987 salmon harvest is 94 million. This is substantially less than salmon harvests realized for recent years. The 1987 pink salmon returns are expected to be weaker than 1986 in Western and Southeastern Alaska and stronger than the 1986 return in Prince William Sound. The 1987 sockeye salmon returns are expected to be weaker than 1986 return in Bristol Bay but comparable to the 1986 return in other areas of the State.

There is much uncertainty associated with the 1987 salmon harvest projections, but the actual harvest is not expected to be below 67 million or above 136 million. Based on the statistical performance of the harvest projections, 1970-1986, only one of five realized harvests would be expected to fall outside this range.

KEY WORDS: salmon, *Oncorhynchus* spp., salmon return forecast, salmon harvest projection.

INTRODUCTION

This report reviews Alaska's 1986 commercial salmon season and presents preliminary salmon return forecasts and projections for the 1987 commercial salmon fisheries. The report is released in November, before final catch figures are available. This is to provide preliminary information to the Board of Fisheries, the fishing industry, and the public well before the season begins.

Forecasts of returns (catch + escapements) for major salmon fisheries as well as projections of the statewide commercial salmon harvest have been published yearly by the Alaska Department of Fish and Game since 1969 (ADF&G 1969-1984; Eggers 1985, 1986). The accuracy of those forecasts and harvest projections are summarized in Table 1. On the average, the return forecasts have been very close to the actual returns, with the forecast exceeding the return by less than 1% (Table 1). With regard to sign, the error has been 31%. The projected statewide harvest has, on the average, been lower than the actual harvest by 7% of the projected harvest (Table 1). The error without regard to

Table 1. Forecasted return, harvest, escapement goal, preliminary return, escapement, harvest, management error (ie difference between realized escapement and escapement goal), and return forecast error for major salmon fisheries where formal forecasts were made, 1970-1986. Projected and realized Alaska commercial salmon harvests with absolute and relative error, 1970-1986. Figures are in thousands of salmon.

	Only Major Fisheries Where Formal Forecasts Are Made[1]										Projected Collective Harvest of all Alask Salmon Fisheries				((1)-(2))
	Forecasted			Actual (Note that Figures Based on Preliminary Returns)			(5)	(5)/(2)	(6)	(6)/(1)			(9)	(9)/(7)	Forcasted Harvest Relative
Year	(1) Return	Harvest	(2) Escapement Goal	(3) Return	(4) Escapement	Harvest	(4)-(2) Management Error (thousands)	%	(1)-(3) Forecast Error (thousands)	%	(7) Projected Harvest	(8) Actual Harvest	(7)-(8) Error	Relative Error	Projected Statewide Harvest
1970	114347	77080	37267	64653	17271	47382	19996	54%	49694	77%	95500	68500	27000	39%	81%
1971	41140	28110	13030	50780	18643	32137	-5613	-43%	-9640	-19%	41500	47500	-6000	-13%	68%
1972	52790	30470	22320	30995	13616	17379	8704	39%	21795	70%	46700	32000	14700	46%	65%
1973	38650	18820	19830	21650	10636	11014	9194	46%	17000	79%	30000	22300	7700	35%	63%
1974	27830	7500	20330	29150	19334	9816	996	5%	-1320	-5%	15600	21900	-6300	-29%	48%
1975	28740	8435	20305	45937	28496	17441	-8191	-40%	-17197	-37%	19900	26200	-6300	-24%	42%
1976	45202	25702	19500	48940	18860	30080	640	3%	-3738	-8%	37100	44400	-7300	-16%	69%
1977	43650	23740	19910	56495	21695	34800	-1785	-9%	-12845	-23%	34700	50800	-16100	-32%	68%
1978	70323	48737	21586	97940	36020	61920	-14434	-67%	-27617	-28%	62900	82300	-19400	-24%	77%
1979	84960	57210	27750	108323	37985	70338	-10235	-37%	-23363	-22%	72000	88800	-16800	-19%	79%
1980	124930	86360	38570	144096	62490	81606	-23920	-62%	-19166	-13%	102600	110000	-7400	-7%	84%
1981	78500	55420	23080	116095	28895	87200	-5815	-25%	-37595	-32%	74500	113300	-38800	-34%	74%
1982	136060	109940	26120	105503	27983	77520	-1863	-7%	30557	29%	135000	109100	25900	24%	81%
1983	97210	74330	22880	129363	28672	100691	-5792	-25%	-32153	-25%	94000	127200	-33200	-26%	79%
1984	119068	81671	37397	150034	47410	102624	-10013	-27%	-30966	-21%	103560	132505	-28945	-22%	79%
1985	123629	86891	36738	164115	43916	120199[2]	-7178	-20%	-40486	-25%	108241	144610	-36369	-25%	80%
1986	147935	113532	34403	137827	37257	100570[2]	-2854	-8%	10108	7%	138015	127864	10151	8%	82%
1970-1986 Averages	80880	54938	25942	88347	29363	58983	-3421	-13%	-7467	0.3%	71283	79369	-8086	-7%	72%
Averages without regard to sign							8072	30%	22661	31%			18139	25%	

1 Preliminary data published in ADF&G (1970-1986)

2 Preliminary harvest figures.

sign has been 25%. The historical performance of the forecasted return to major salmon fisheries (Figure 1), as evidenced by the breadth of the 80% confidence interval on the relation between observed and actual return (1970-1986), has been somewhat poorer than the historical performance of the projected statewide commercial harvest projections (Figure 2). The errors have been due to inadequate knowledge of salmon escapement, the numbers of juvenile salmon produced from these escapements, and of the natural variation in survival of salmon throughout various life history stages.

Glossary

Salmon return or run:	The total number of mature salmon returning in a given year from ocean rearing areas to coastal waters.
Escapement, spawning population or brood stock:	That portion of a salmon run which is not harvested and survives to reach the spawning grounds or hatchery.
Forecast:	Forecast harvests and returns are estimated using information such as parent-year escapements, subsequent fry abundance, spring sea water temperatures, and escapement requirements.
Harvest projections:	Harvest projections are averages of recent harvests. They may be modified subjectively when qualitative escapement or other relevant information is available. Only harvests are projected, and harvest projections are given only for salmon runs which have no forecast.

Alaska Pacific Salmon Species

Common Name	Scientific Name
chinook, king	*Oncorhynchus tshawytscha*
sockeye, red	*Oncorhynchus nerka*
coho, silver	*Oncorhynchus kisutch*
pink, humpy, humpback	*Oncorhynchus gorbuscha*
chum, dog	*Oncorhynchus keta*

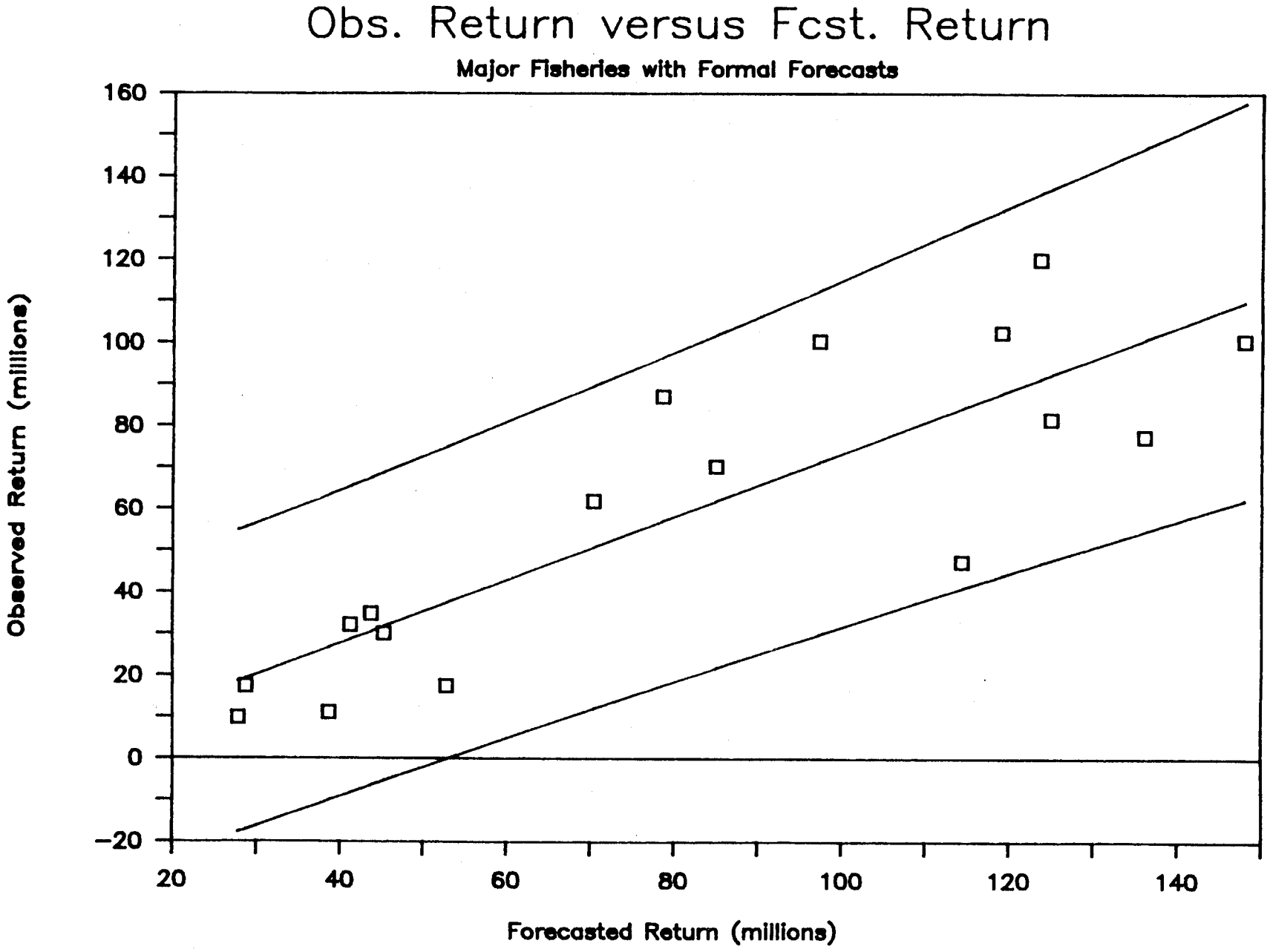

Figure 1. Relationship between observed return (millions) and forecasted return (millions) for major salmon fisheries with formal forecasts, 1970-1986. Also shown are the regression line, Y = 2.67 + 0.7622 X, R squared = 0.724, together with 80% confidence intervals; where, Y = Observed Return and X = Forecasted Return.

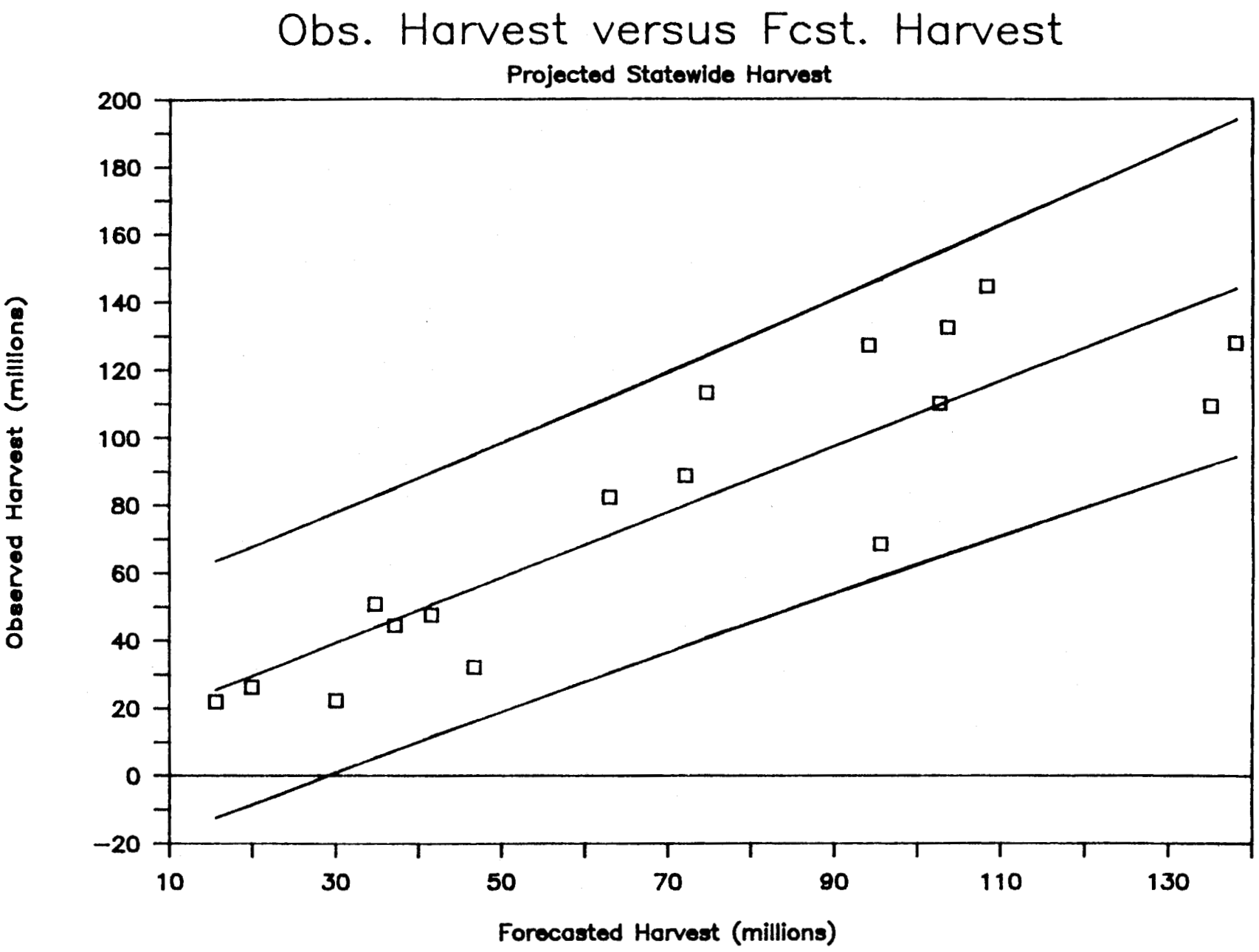

Figure 2. Relationship between observed harvest (millions) and projected harvest (millions) for Alaska commercial salmon fisheries, 1970-1986. Also shown are the fitted regression line, Y = 10.28 + 0.9692 X, R squared = 0.779, together with 80% confidence intervals; where, Y = Observed Harvest and X = Forecasted Harvest.

Brood years of salmon returning to spawn in 1987, by species and age[1]

Species	Age of Returning Salmon in Years				
	2	3	4	5	6
Pink	1985				
Chum		1984	1983	1982	
Coho		1984	1983		
Sockeye			1983	1982	1981
Chinook			1983	1982	1981

[1] The brood years listed for each species generally comprise more than 90% of the run.

Increasing salmon escapement levels through the period 1970-1986, as well as mild winters and generally warmer ocean water temperature contributing to higher juvenile survival are thought to be the major factors responsible for the recent record-breaking commercial salmon harvest in Alaska. These favorable environmental conditions have worked in tandem with industry sacrifices and careful fisheries management that insured adequate well-distributed salmon escapements in the early 1970s when salmon returns were weak throughout the state. Sockeye and pink salmon returns in almost all areas of the state have now rebounded to robust levels. State and non-profit hatcheries have contributed several million salmon to the 1986 harvest of 127 million fish. These supplemental production sources are becoming increasingly significant in Cook Inlet and Prince William Sound areas.

The boundaries of and major fishing areas within the Southeastern, Central, and Western statistical regions are shown in Figure 3. These regions and areas are the ones used in the Department's statistical leaflet series and prior statistical reports.

Acknowledgments

Information on which this report is based was contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists, not individually identified, supplied reviews of the 1986 fishing season. These were summarized by Mike Dean. Individual credit for forecast material is given with the area forecast discussions in the Appendix.

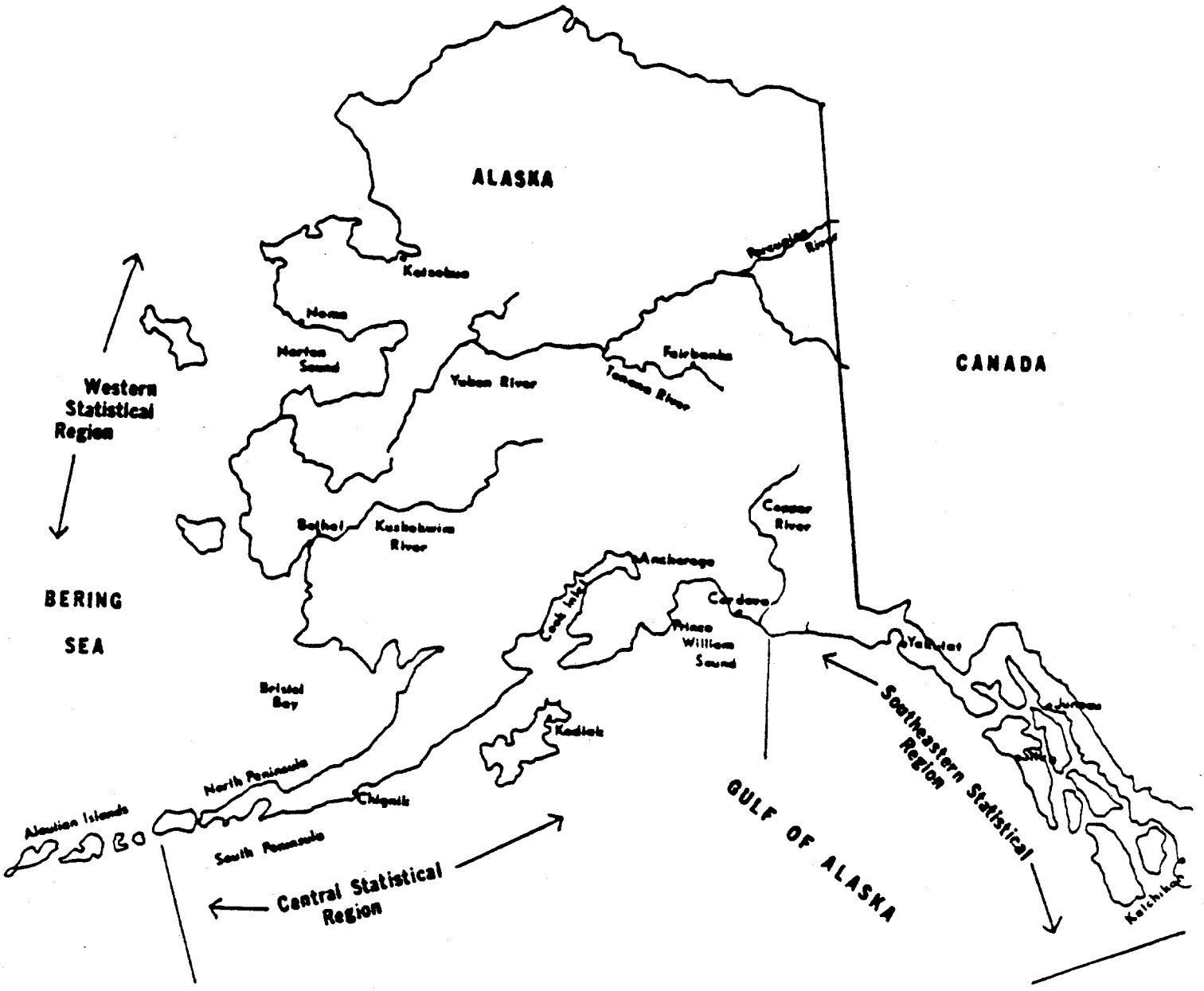

Figure 3. Alaska Department of Fish and Game Commercial Fisheries Statistical Regions.

REVIEW OF THE 1986 ALASKA COMMERCIAL SALMON FISHERY

The 1986 Alaska commercial salmon harvest is estimated to be the fourth largest in history with a catch of 127.8 million fish weighing 589.6 pounds (Figure 4).

This is the seventh consecutive year that the Alaska commercial salmon harvest has exceeded the 100 million mark.

The ex-vessel value for this season is estimated to be worth $404 million dollars and may be higher when more precise price information becomes available.

The 1986 salmon harvest was less than the pre-season catch projections of 138 million fish (Table 1). This was largely due to the 1986 pink salmon catches (76.7 million) being lower than the 1986 catch projection (95.6 million). However, sockeye salmon catches (32.2 million) were higher than anticipated (24.5 million).

Comparisons of actual and forecasted 1986 salmon returns with errors and relative errors for salmon fisheries where formal forecasts were generated are presented in Table 2.

Preliminary 1986 catch estimates by fishing area and statistical region are summarized in Table 3. These estimates are presented in more detail by management region in Tables 4 through 7.

Southeastern Region

Southern Southeastern fishing areas had very good landings of pink and coho salmon in all their fisheries. However, the northern areas experienced late returns of sockeye salmon, along with poor returns of pink and coho salmon.

The pink salmon harvest was about 46.0 million fish with the majority of the harvest coming from the southern area purse seine fisheries. The harvest of pink salmon in northern Southeastern districts was slightly under 1.0 million pink salmon which was considerably below the forecasted harvest of 6.5 million fish.

The sockeye salmon harvest was 1.4 million fish which was well above historical averages. However, the sockeye run was large with very low catches in the gillnet fisheries occurring for several fishing periods early in the season. Good landings of sockeye salmon occurred in the Prince of Wales, Lynn Canal, District 6 gillnet fisheries and in the southern purse seine fishery. Very weak sockeye salmon returns were apparent in the District 8 Stikine River fishery.

The harvest of 3.3 million coho salmon set a new season record for the Southeastern region. Very strong harvests of coho salmon occurred in the southern net fisheries as well as in the outside and southern area troll fishery. Conservation problems existed in the northern areas with weak returns of coho salmon that resulted in the closure of several inside fishing districts. The troll fishery harvested an estimated 2.3 million coho salmon.

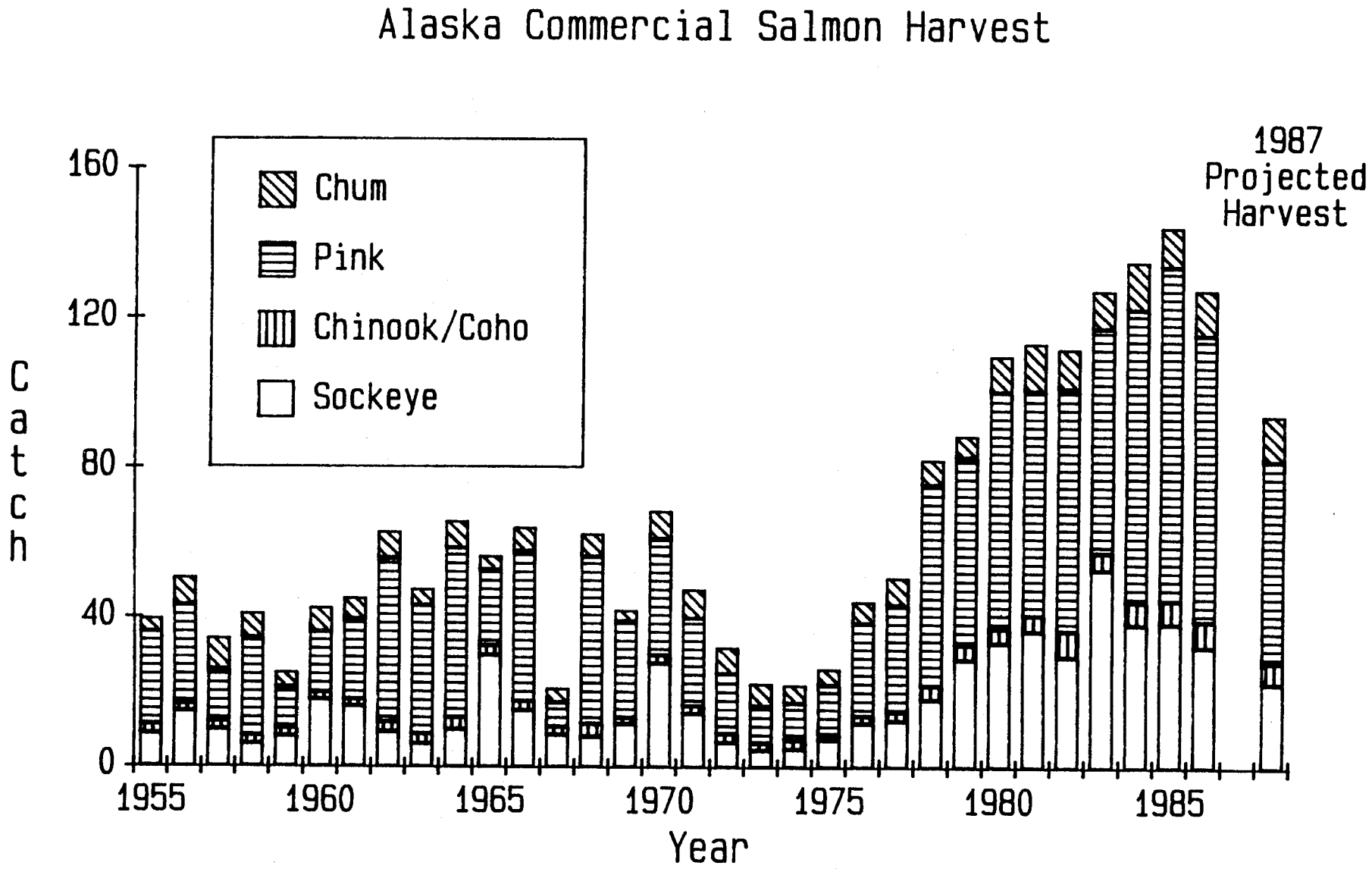

Figure 4. Alaska commercial salmon harvests by species, 1955-1986, and the 1987 projected harvest.

Table 2. Comparison of actual and forecast 1986 salmon returns, with errors and relative errors, for some major Alaska salmon fisheries.

Area	Species	(1) Harvest	(2) Escapement[1]	(3) Return (1) + (2)	(4) Forcasted Return	(5) Error (4) - (3)	(6) Relative Error (5)/(3) x 100%
		Thousands of Fish					
Southern Southeastern	pink	44427	13855	58282	37900	-20382	-35%
Northern Southeastern	pink	1149	3289	4438	11100	6662	150%
Southeastern total	pink	45576	17144	62720	49000	-13720	-22%
Prince William Sound	pink	11391	1128	12519	27600	15081	120%
	chum	1682	266	1948	1266	-682	-35%
PWS Coghill District	sockeye	400	74	474	552	78	16%
Copper River	sockeye	781	652	1433	1559	126	9%
	chinook	41	21	62	45	-17	-27%
Lower Cook Inlet-Southern and Outer Districts	pink	1408	1650	3058	2269	-789	-26%
Upper Cook Inlet	sockeye	4740	1085	5825	5200	-625	-11%
Kodiak	pink	11800	4000	15800	19730	3930	25%
Chignik[2]	sockeye	1959	787	2746	2811	65	2%
	pink	634	632	1266	2640	1374	109%
South Peninsula[3]	pink	3904	1700	5604	8400	2796	50%
Bristol Bay[4]	sockeye	15889	7994	23883	22541	-1342	-6%
Bristol Bay, Nushagak District	chinook	64	43	107	183	76	71%
	pink	281	72	353	4100	3747	1061%
Bristol Bay, Togiak District	chinook	20	9	29	39	10	34%
TOTAL		100570	37257	137827	147935	10108	7%

[1] Preliminary data compiled 15 November 1986.
[2] The harvest includes estimated interceptions of Chignik bound sockeye taken at Cape Igvak, Stepovak Ba,, Aniakchak, and Hook Pass fisheries.
[3] The harvest does not include June catches of migrating pink salmon bound for other areas.
[4] Inshore harvest only.

Table 3. Preliminary 1986 Alaska commercial salmon harvest by species and fishing area.

Fishing Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Southern Southeastern	62.7	899.2	1520.0	44427.0	1788.2	48697.1
Northern Southeastern	197.8	534.1	1833.8	1149.0	1509.8	5224.4
Southeastern Statistical Region Total	260.5	1433.3	3353.7	45576.0	3298.0	53921.4
Cordova Area	42.1	1288.5	426.2	11390.7	1700.3	14847.8
Cook Inlet Area	40.8	4974.5	762.5	2710.2	1199.4	9687.5
Kodiak Area	4.4	3186.0	167.0	11800.0	1132.0	16289.4
Chignik	3.0	1644.9	115.1	634.2	175.3	2572.6
South Peninsula	5.1	1210.0	227.0	3904.0	1701.7	7047.8
Central Statistical Region Total	95.4	12304.0	1697.8	30439.1	5908.7	50445.0
Aleutian Islands	0.0	5.0	0.0	38.0	38.0	81.0
North Peninsula	12.0	2420.0	202.0	27.0	284.0	2945.0
Bristol Bay Area	93.0	15889.0	177.0	394.0	1131.0	17684.0
Kuskokwim Area	45.0	142.0	736.9	15.9	349.3	1289.1
Yukon Area	99.8	0.0	47.3	0.0	859.8	1006.9
Norton Sound	6.3	0.2	35.6	41.3	146.9	230.3
Kotzebue Area	0.1	0.0	0.0	0.0	261.4	261.5
Western Statistical Region Total	256.2	18456.3	1198.8	516.2	3070.4	23497.8
ALASKA TOTAL	612.1	32193.5	6250.3	76531.2	12277.1	127864.3

1 Compiled 15 November 1986, catches in thousands of fish.

Table 4. Preliminary 1986 Southeastern Alaska commercial salmon harvest by species and management area[1].

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Southern Southeastern						
Portland Canal gill net	1.0	145.5	59.4	902.4	268.2	1676.5
Annette Island gill net	0.1	27.9	43.1	511.7	94.4	677.2
Annette Island trap	0.0	3.1	1.4	458.9	1.8	465.1
Prince of Wales gill net	1.7	145.7	195.0	315.4	82.5	740.3
Stikine River gill net	0.1	4.2	7.4	4.9	5.9	22.6
Southern hatcheries	1.5	0.0	190.1	31.7	239.4	462.7
Southern districts seine	11.8	571.8	515.3	42127.4	1090.5	44316.9
Southern districts troll	46.5	1.0	508.2	74.7	5.4	635.7
Southern Southeastern total	62.7	899.2	1520.0	44427.0	1788.2	48997.0
Nothern Southeastern						
Taku-Snettisham gill net	2.7	72.6	30.4	16.5	58.6	180.8
Lynn Canal gill net	2.8	289.7	81.4	38.1	377.4	789.3
Yakutat gill net	1.3	147.2	86.3	6.8	15.8	257.4
Northern hatcheries	1.1	3.3	4.0	125.5	683.6	817.4
Northern districts seine	0.3	15.6	13.8	854.9	328.4	1212.9
Northern districts troll	189.6	5.9	1617.9	107.2	46.0	1966.6
Northern Southeastern total	197.8	534.1	1833.8	1149.0	1509.8	5224.4
SOUTHEASTERN REGION TOTAL	260.5	1433.3	3353.7	45576.0	3298.0	53921.4

[1] Compiled 15 November 1986, catches in thousands of fish.

Table 5. Preliminary 1986 Central Region Alaska commercial salmon harvest by species and management area[1].

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Cordova Area						
Bering River	0.1	19.0	115.8	0.0	0.2	135.2
Copper River	40.7	780.8	296.0	3.0	17.6	1138.1
Prince William Sound						
Hatcheries	0.0	0.0	2.2	909.2	20.7	932.1
Coghill District	0.8	400.1	0.9	214.6	246.0	862.4
Unakwik District	0.0	25.8	0.0	6.7	7.1	39.7
Eshamy District	0.0	0.9	0.1	38.1	5.3	44.5
General purse seine	0.5	61.9	11.3	10219.0	1403.3	11696.0
Prince William Sound total	1.3	488.7	14.4	11387.7	1682.4	13574.6
Cordova Area total	42.1	1288.5	426.2	11390.7	1700.3	14848.0
Cook Inlet Area						
Lower Cook Inlet						
Outer District	0.0	48.5	5.1	401.8	11.7	467.0
Southern District	0.8	36.8	3.1	542.5	5.6	588.8
Kamishak District	0.0	146.5	9.9	423.8	61.7	641.9
Eastern District	0.0	3.0	0.0	40.2	3.8	47.0
Lower Cook Inlet total	0.8	234.8	18.1	1408.3	82.7	1744.7
Upper Cook Inlet						
Central District	24.7	4602.7	661.1	1166.7	1043.9	7499.1
Northern District	15.3	137.1	83.3	135.3	72.9	443.8
Upper Cook Inlet total	40.0	4739.7	744.4	1301.9	1116.8	7942.9
Cook Inlet Area total	40.8	4974.5	762.5	2710.2	1199.4	9687.5
Bristol Bay						
Egegik District	2.0	5009.0	32.0	3.0	94.0	5140.0
Ugashik District	3.0	4928.0	22.0	0.0	97.0	5050.0
Naknek-Kvichak District	4.0	2890.0	3.0	86.0	208.0	3191.0
Nushagak District	64.0	2758.0	73.0	281.0	462.0	3638.0
Togiak District	20.0	304.0	47.0	24.0	270.0	665.0
Bristol Bay total	93.0	15889.0	177.0	394.0	1131.0	17684.0
CENTRAL REGION TOTAL	175.9	22152.1	1365.8	14494.9	4030.8	42219.5

[1] Compiled 15 November 1986, catches in thousands of fish.

Table 6. Preliminary 1986 Westward Region Alaska commercial salmon harvest by species and management area[1].

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak Area	4.4	3186.0	167.0	11800.0	1132.0	16289.4
Chignik Area	3.0	1644.9	115.1	634.2	175.3	2572.6
Alaska Peninsula and Aleutians						
South Peninsula	5.1	1210.0	227.0	3904.0	1701.7	7047.8
North Peninsula	12.0	2420.0	202.0	27.0	284.0	2945.0
Aleutian Islands	0.0	5.0	0.0	38.0	38.0	81.0
Alaska Penin. Aleut. total	17.1	3635.0	429.0	3969.0	2023.7	10073.8
WESTWARD REGION TOTAL	24.5	8465.9	711.1	16403.2	3331.0	28935.8

[1] Compiled 15 November 1986, catches in thousands of fish.

Table 7. Preliminary 1986 Arctic-Yukon-Kuskokwim Region Alaska commercial salmon harvest by species and management area[1].

	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Management Area						
Kuskokwim Area						
Kuskokwim River	19.4	95.4	660.0	2.8	309.2	1086.8
Kuskokwim Bay	25.6	46.6	76.9	13.1	40.1	202.3
Kuskokwim Area total	45.0	142.0	736.9	15.9	349.3	1289.1
Yukon River						
Lower Yukon River	95.6	0.0	46.8	0.0	782.5	924.9
Upper Yukon River	4.2	0.0	0.4	0.0	77.4	82.0
Yukon River total	99.8	0.0	47.3	0.0	859.8	1006.9
Norton Sound	6.3	0.2	35.6	41.3	146.9	230.3
Kotzebue Area	0.1	0.0	0.0	0.0	261.4	261.5
ARCTIC-YUKON-KUSKOKWIM REGION TOTAL	151.2	142.3	819.8	57.2	1617.4	2787.8

[1] Compiled 15 November 1986, catches in thousands of fish.

The chum salmon harvest of over 2.9 million fish is considered very good for recent years with an early harvest occurring at Hidden Falls Hatchery and late season fisheries occurring through October in the Lynn Canal area.

The 1986 chinook salmon harvest by all Southeastern Alaska commercial and recreational fisheries is estimated to be 280,000 fish. The winter troll fishery harvested approximately 23,000 chinook salmon from 1 October 1985 to 14 April 1986. During the summer season the troll fishery harvested an estimated 213,000 fish from three chinook salmon fishing periods. The combined winter and summer season chinook salmon harvest by the troll fishery is estimated to be 236,000 fish. In addition to the troll catch, the incidental net catch of chinook salmon was about 22,000 and the recreational fisheries took an estimated 22,000 chinook salmon.

Central Region

Prince William Sound:

The total harvest of all salmon species in the Prince William Sound and Cordova area was 14.8 million fish and was greatly below pre-season expectations. The pink salmon harvest (including hatcheries) of 11.3 million fish was only 50% of the pre-season forecasted harvest of 23.4 million pink salmon.

The sockeye salmon harvest was 1.3 million fish and was well above the long term average harvests, however this was only slightly above lower expected range (1.1 to 1.8 million) of the pre-season harvest projection. The Copper River gillnet fishery produced a harvest of about 780,000 sockeye salmon while the Coghill District recorded the second largest harvests for that district with a catch of 400,000 sockeye salmon.

The combined coho salmon harvests for the Copper and Bering River Districts totaled 412,000 fish which was below the minimal expected harvest of 450,000. The Districts were closed early due to lagging escapements into key systems which were 60% below the recent six-year average as of mid-September.

The chum salmon harvest of about 1.7 million fish was the second largest on record and well above the forecast. The strong chum run was due in part to chum salmon returns to the area hatcheries.

The ex-vessel value of the area fisheries was estimated to be worth $29.4 million with the value of gillnet harvest exceeding that of the purse seine harvest.

Bristol Bay:

The total Bristol Bay salmon harvest was 17.6 million fish and was worth an estimated ex-vessel value of $144.2 million dollars, the highest value ever recorded for this fishery.

The total sockeye salmon return was 23.8 million fish which was virtually identical to the pre-season pooled forecast of 22.5 million fish. The commercial harvest of 15.8 million sockeye salmon was below the recent 10-year average harvest but well above the previous 20-year average harvest of

12.7 million. It appears that the sockeye salmon return may have been about a week later than normal. Spawning escapement objectives were met or exceeded in all systems, except the Kvichak River, where spawning requirements were only 24% of the objective in spite of a season-long closure of the Kvichak section.

The king salmon run was apparently weak in Bristol Bay this season. The Nushagak District had a commercial catch of 64,000 fish, an escapement of 22,000 to 43,000, and an estimated subsistence/sport harvest of 9,000, for a total run of only around 116,000 chinook salmon. This was 63% of the forecast return and was the smallest run since 1975.

Chum salmon production was above average with a commercial catch of 1.1 million chum salmon. Early in the season it appeared as if a large chum salmon run was in progress, but as the season progressed catches dropped off and did not exhibit much strength in the middle to late portion of the run.

The pink salmon return to the Nushagak District was substantially below what was anticipated (3.1 million harvest) yet the return of pink salmon to the Naknek-Kvichak was relatively strong. The Nushagak pink salmon catch was 281,000 with an escapement of 72,000 fish. The Naknek-Kvichak pink salmon run amounted to 518,000 fish, catch and escapement combined.

The coho salmon run did not materialize as hoped this season and the Nushagak District was closed to fishing on 5 August, the other districts were reduced from normal fishing periods. Escapements appeared to be well below desired levels but surveys have been hampered by weather and budget reductions. The area-wide commercial harvest was only 177,000 coho salmon.

Upper Cook Inlet:

The 1986 commercial salmon season in Upper Cook Inlet was very successful, harvesting just under 8.0 million fish, a new all-species harvest record. With sockeye salmon selling at $1.41 a pound for most of the season, the total ex-vessel value of the fishery set a new record of $45.0 million dollars.

The sockeye harvest of 4.7 million fish was the second largest on record and very close to the pre-season forecast of 4.2 million sockeye salmon.

The overall sockeye salmon returns were several days late into the Inlet and nearly a week late in entering the rivers. The best catches occurred in the drift fleet and on the lower eastside set net beaches. Escapements to all monitored systems were at or near desired levels.

The chum salmon catch of 1.1 million represents the third best year on record. As usual, most of the catch was taken in the drift fishery. Average prices for chum salmon were $.39 a pound.

The pink salmon harvest of 1.3 million was slightly above the even-year average harvests but larger than the weak even-year harvest experienced since 1960. With a price of $.15 to $.18 per pound the drift fishermen actively avoided concentrations of pink salmon in search of more valuable species.

Pink salmon escapements were excellent in the Susitna and good in the Kenai Rivers.

The harvest of 744,000 coho samon was just below the record harvest of 770,000 coho salmon in 1982. The Susitna run was at least a week early moving into the Central District, but the delay in moving through the district apparently led to a higher than normal exploitation by the drift fleet and the escapements were only fair. The return of early run Kenai River coho salmon was slightly above average. Escapements into the Kenai River, as indexed by sport harvests in river, were fair. The average price paid for coho salmon was $.60 per pound.

The 1986 season chinook salmon catch of about 40,000 is the highest observed since the end of any directed commercial fisheries on early run fish. The Northern District chinook fishery took about 13,000 chinook salmon this season with no discernible affects on any subsequent sport fisheries. The eastside set net harvest of around 20,000 chinook salmon was the highest catch in recent years. The overall chinook salmon return was very strong and escapements were very high.

Lower Cook Inlet:

The total harvest of all species in Lower Cook Inlet was approximately 1.7 million fish and was 82% above the historical average. The 1986 harvest was the largest even-year harvest since 1962. The sockeye salmon harvest of 235,000 was three times the 30-year average but similar to the recent harvest levels. The pink salmon return was sporadic with three streams producing over 90% of the harvest. The pink salmon catch of 1.4 million was almost twice the historical average for Lower Cook Inlet.

The chum salmon harvest of 83,000 was half of the pre-season forecasted harvest. Coho salmon harvests for the season was about 18,000 fish which was over twice the historical average for the area. The ex-vessel value of this season is estimated to be close to $2.5 million dollars.

Westward Region

Kodiak:

The 1986 commercial salmon harvest of over 16.3 million fish consisted of 3.1 million sockeye salmon, 11.8 million pink salmon, 1.1 million chum salmon, about 167,000 coho salmon, and 4,370 chinook salmon.

The harvest of 11.8 million pink salmon was below the pre-season forecast of 15.7 million fish, but was well above the historical even-year average harvest of 8.6 million fish. The 1986 pink salmon harvest ranks ninth for all years since 1933. Good to excellent pink salmon escapements were achieved in all major and minor systems, except the Karluk River, a few minor streams on the eastside, and the Kinak River on the Mainland.

The sockeye salmon harvest of 3.1 million fish was the largest ever recorded since the late 1920s. Runs were especially strong in the Alitak Bay, Westside, and Red River Districts. Escapements were met or exceeded in all systems except for the Frazer River and Pauls Bay where no commercial fishery

was allowed. The Cape Igvak interception fishery accounted for 186,000 Chignik-bound sockeye salmon.

The chinook salmon harvest of 4,700 fish was comparable to recent year harvests. These chinook salmon were taken incidentally in the June sockeye salmon fisheries.

The harvest of about 1.1 million chum salmon was slightly above the long term harvest average of 742,000 fish and ranks eight since 1933. Escapements appeared to be satisfactory to all chum salmon producing systems.

The total value of the 1986 Kodiak Area salmon harvest to the fishermen was estimated to be in excess of $39.5 million. The previous high value was $33.0 million in 1981. Sockeye salmon accounted for 70% or $27.7 million of the 1986 total value.

Chignik:

The harvest of 1.6 million sockeye salmon was within the point estimate of the pre-season forecast of 2.1 million sockeye salmon but at this time does not include the estimated number of Chignik-bound sockeye salmon that were intercepted in other fisheries.

Sockeye salmon escapements appear to have been met and exceeded for both the early and late runs. The counting weir washed out during a portion of the season, but escapement was enumerated with a temporary side scanning sonar until the weir could be re-installed.

The coho salmon catch of about 115,000 fish was weaker than anticipated. Based on parent year escapements the return should have been 200-300,000 fish.

The pink and chum salmon returns to Chignik were considered good to excellent. However, due to markets being restricted to fresh or frozen products, the harvests were very minimal in comparison to historical averages. For the most part, escapements were excellent to all systems. The ex-vessel value for the fishery was estimated to be worth over $18.9 million to the area fishermen.

Alaska Peninsua and Aleutians:

The North Peninsula sockeye salmon harvest of 2.4 million fish was the second highest on record. The chum salmon harvest was 284,000 fish and the return was considered below average with escapements estimated to be poor to fair in most areas. The coho salmon returns were variable with strong returns into the Nelson Lagoon, fair in Port Heiden, and poor into the Cinder River. However, the coho salmon catch of 202,000 was the second highest on record.

The South Peninsula sockeye salmon catch of about 1.2 million came from the June interception fishery at "False Pass" and from strong returns to local systems in July and August. The June fishery operated under several regulatory changes this season and produced a total harvest for June of 466,000 sockeye salmon and 344,000 chum salmon from an allowable quota of 927,000 sockeye salmon and 400,000 chum salmon. The harvest of 3.9 million

pink salmon was well below season expectations of a 6.4 million pink salmon harvest. Pink salmon escapements were generally good in all systems on the main peninsula but weak in the area around South Unimak. Chum salmon returns were extremely strong into local areas during July and August. Escapements of chum salmon were also excellent in all systems except for Little John Bay. Most of the coho salmon harvest this season was taken incidentally during the pink salmon fishery.

The Aleutian Islands area had a dismal salmon season with a pink salmon harvest of only 38,000 and an escapement of 150,000 pink salmon. The pink salmon catch was anticipated to be about 2.0 million fish but apparent survival from the parent year stocks was extremely low and resulted in the area being closed most of the season.

Arctic-Yukon-Kuskokwim Region

Kotzebue:

The commercial catch of chum salmon this year was 261,436 fish weighing approximately 2.3 million pounds, and valued at $931,000 dollars to the 187 permit holders who fished this year. Compared to the last ten years, this season ranks fifth in total catch and third in value. Fishermen received relatively low prices this season which fluctuated between $.39 and $.53 per pound but averaged only $.41 for the year. Catches were above average during the first few periods; then dropped to well below average in the midpoint of the fishery and then rose again to average toward the end of the season. The large return of five-year-old fish at the start of the season contributed to above average catches with the poor return of three- and four-year-old fish causing the harvest to drop to below average later in the season. Aerial surveys of index spawning streams were hampered by weather this season. However, completed surveys indicate adequate escapements on both the Noatak and Kobuk River systems.

Norton Sound:

The 1986 Norton Sound commercial salmon harvest totaled 230,308 fish which was comprised of 6,303 chinook salmon, 146,912 chum salmon, 41,260 pink salmon, 35,600 coho salmon, and 233 sockeye salmon. The harvest of chinook salmon was below the 1985 chinook salmon harvest of 19,500 fish but near the recent 10-year harvest average of 8,500 fish.

Foreign processing vessels were allowed in Norton Sound at the start of the season to buy pink and chum salmon from the Golovin and Moses Point fishermen as there was not a domestic market available for the fish. The foreign processing vessels departed Norton Sound by 25 July before the start of the coho salmon returns. A total of 163 fishermen participated in the Norton Sound fisheries this year which was estimated to produce the lowest dollar value, $537,500 in 1986, on record since 1977.

Kuskokwim:

The commercial salmon season began in the Kuskokwim area on 12 June in District W-4, Quinhagak, but fishermen chose to remain on the beach striking for higher prices. District W-5, Goodnews Bay opened on 19 June. The

Kuskokwim River Districts W-1 and W-2 opened 26 June, which is the latest opening on record due to a weak chinook salmon return as indicated by subsistence fisheries and the Department test fish programs.
The 1986 commercial catch for all four districts combined was the second highest catch on record with 1.2 million salmon. The 142,000 sockeye salmon catch was the highest on record and the coho salmon harvest of 736,000 was second only to the record catch of 829,000 fish set in 1984. There was a record 791 permit holders participating in the Kuskokwim fishery this year. The ex-vessel value paid to permit holders this year amounted to about $4.5 million dollars and was the second highest value on record.

Salmon escapement objectives were only partially achieved this season. In the Kuskokwim Bay, the Goodnews River chinook salmon escapements were poor, but chum and sockeye salmon escapement goals were achieved. The Kanektok River chinook salmon escapements appeared to have been met while sockeye and chum salmon escapements were among the lowest on record which resulted in a closure of commercial fishing in W-4, Quinhagak. The escapement projects on the Kuskokwim River indicated that chinook salmon escapements ranged from 28-32% of the desired objective despite a complete closure of commercial fishing during the chinook salmon run. Chum salmon escapements ranged from 50-75% of the objectives and coho salmon escapement data is still being prepared.

Yukon River:

Concern over a poor fall chum salmon return and continuing low level chinook salmon escapements led to several regulatory changes and a conservative management approach to the area fisheries this season.

The 1986 Yukon River area commercial catch was just over 1.0 million fish this season. The commercial harvest of about 99,000 chinook salmon was about 25% below the recent five-year-averages. This was primarily due to restrictions imposed throughout the river to keep the harvest to midpoint of the guideline range. Chinook salmon escapements into Lower Yukon systems appear to be average or slightly above average. Survey conditions have been marginally acceptable in the Upper Yukon area but it appears that escapement objectives may be achieved in most of the Upper systems. Escapement data is not yet available on chinook salmon in Canadian systems.

The summer chum salmon return was very strong with the early portion of the return occurring with the chinook salmon run. Special summer chum salmon fishing were allowed this season to harvest this strong summer chum return. The harvest of 668,960 summer chum salmon from the Lower Yukon River was the fourth largest on record. The catch of about 53,000 summer chum salmon from District 6, Tanana River, was the third largest. Also the sale of 269,000 pounds of chum salmon roe was an all-time record for District 4.

The fall chum salmon harvest of 113,000 fish from the Lower Yukon was slightly above the guideline range of 0-110,000 fall chum salmon. Inseason indicators revealed that the early portion of the run was considerably stronger than anticipated and deemed adequate to allow some fishing on these stocks. Through 15 September, the total harvest of Yukon River fall chum salmon was 53% below recent five-year harvests.

The coho salmon harvest of around 46,800 fish were taken incidentally in the fall chum salmon fishery and when that fishery was closed no further directed coho salmon fisheries were allowed. The fisheries for both the Upper and Lower Yukon River areas were estimated to be worth an ex-vessel value of $6,248,700.

PRELIMINARY FORECASTS OF 1987 SALMON RETURNS TO SELECTED ALASKA FISHERIES

The Department's salmon management program includes a number of salmon return forecast projects. Forecast fisheries are selected using several criteria, including economic importance, feasibility, compatibility with existing programs, and management needs. Forecast fisheries are:

Southern Southeastern	-	pink salmon
Northern Southeastern	-	pink salmon
Prince William Sound	-	pink, chum, and Coghill District sockeye
Prince William Sound/ Copper River	-	sockeye and chinook salmon
Upper Cook Inlet	-	sockeye salmon
Kodiak	-	pink salmon
Chignik	-	sockeye salmon
Bristol Bay	-	sockeye and chinook salmon

In 1986 89% of the total statewide harvest was taken in these fisheries (Table 1).

A variety of information was used to make salmon return forecasts, including escapement magnitudes and distribution, egg deposition, survival to intermediate life stages, high seas abundance, environmental conditions, and population age composition. The return, with upper and lower confidence limits are predicted for each forecast fishery. In general, based on past experience, the actual return can be expected to fall within the range (between the lower and upper limits) somewhat less than half the time. In 1986, eight of seventeen return forecasts were outside their respective ranges. The 1987 forecasts and ranges are summarized in Table 8.

Forecast abstracts are given below; the reader is referred to the Appendix for further details.

Southeastern Alaska Pink Salmon

The total Southeastern pink salmon harvest is expected to be 26.3 million, a substantial decrease from the 1986 harvest of 45.6 million. A return of 27.2 million pink salmon is expected to southern Southeastern districts in 1987 with an expected harvest of 21.2 million. The parent escapement for the 1985, the parent year for the 1987 return, was the second largest on record, but winter temperatures were the lowest on record. Consequently, the survival is expected to be poor and the 1987 run weaker than it has been in recent years. A return of 9.7 million is expected to occur in northern Southeastern districts in 1987, with the harvest expected to be 5.1 million. There was a

Table 8. Preliminary forecasts of salmon returns and commercial harvests for some major Alaska fisheries in 1987.

Area	Species	Forecast Return	Escapement Goal	Estimated Harvest	Forcasted Return[1] Range	Estimated Harvest Range
		Thousands of Fish				
Southern Southeastern	pink	27200	6000	21200	18700 - 35700	12700 - 29700
Northern Southeastern	pink	9700	4600	5100	6600 - 12800	2000 - 8200
Southeastern total	pink	36900	10600	26300	27852 - 45948	17252 - 35348
Prince William Sound[2]	pink	21400	5400	16000	17360 - 25440	11960 - 20040
	chum	1689	413	1276	1274 - 2103	862 - 1690
PWS Coghill District	sockeye	409	50	359	307 - 511	257 - 461
Copper River	sockeye	1659	721	938	1346 - 1971	625 - 1250
	chinook	47	15	32	38 - 57	36 - 39
Upper Cook Inlet	sockeye	5800	1000	4800	4800 - 6800	3800 - 5800
Kodiak[3]	pink	8000	2200	5800	6550 - 9450	4350 - 7250
Chignik[4]	sockeye	3100	650	2450	2468 - 3732	1818 - 3082
Bristol Bay[5]	sockeye	16100	9700	8700	1700 - 39200	0 - 29400
Bristol Bay, Nushagak District	chinook	133	75	58	90 - 176	15 - 101
Bristol Bay, Togiak District	chinook	38	15	23	10 - 70	0 - 55
TOTAL		95275	30839	66736	77687 - 120486	46848 - 89647

[1] Compiled 15 November 1986. The forecast return and harvest ranges were estimated by several techniques. Based on past experience, somewhat less than half of the salmon returns and harvests can be expected to fall within their respective ranges.

[2] Includes supplemental production, PWS pink salmon escapement goal includes 2.9 million hatchery harvest, PWS chum salmon escapement includes no anticipated hatchery harvests.

[3] Includes supplemental production.

[4] Includes estimated interceptions of Chignik bound sockeye salmon at Cape Igvak and Stepovak Bay.

[5] Inshore harvests only.

record escapement to northern Southeastern districts in 1985 but winter temperatures were very cold with little snow cover. As a result of these winter conditions fry survival was generally poorer than recent years, and only moderate returns are expected from the exceptional parent escapements.

Prince William Sound Pink, Chum, and Coghill River Sockeye Salmon

The 1987 Prince William Sound common property harvest of pink salmon is expected to be 16.0 million. Of this 16.0 million common property harvest, 58% is expected to be hatchery fish. In addition, 2.9 million pink salmon are expected to be harvested at hatcheries. The expected 1987 chum harvest is 1.28 million. The anticipated pink harvest is up and the anticipated chum salmon harvest is down from 1986 levels. The expected 1987 harvest of Coghill sockeye salmon is 359,000 down from the 1986 level.

Prince William Sound/Copper River Sockeye and Chinook Salmon

A harvest of 938,000 sockeye and 32,000 chinook salmon is expected in 1987 for the Copper and Bering Rivers. The anticipated sockeye salmon harvest is up and the anticipated chinook salmon harvest is down from the 1986 level.

Upper Cook Inlet Sockeye Salmon

A harvest of 4.8 million sockeye salmon is expected in 1987. The return is expected to be comparable to 1986 levels.

Kodiak Pink Salmon

The 1987 Kodiak pink salmon return forecast is 8.0 million with an expected catch of 5.8 million. This is approximately one-half of the 1986 level.

Chignik Sockeye Salmon

The 1987 return of sockeye salmon is expected to be 3.1 million with a catch of 2.45 million, down from 1986 levels.

Bristol Bay Sockeye and Chinook Salmon

The 1987 return of sockeye salmon to Bristol Bay is expected to be 16.1 million with a harvest of 8.7 million expected. The Standard ADF&G forecast (15.3 million) was consistent with the forecast based on Japanese Research Catches (17.5 million). The return to the Kvichak River system is expected to be below or near escapement goals. The 1987 catch is expected to be substantially below the 1986 level. The 1987 return of Nushagak and Togiak chinook salmon is expected to be 133,000 and 38,000, respectively.

PROJECTED 1987 ALASKA COMMERCIAL SALMON HARVESTS

Projections of the 1987 Alaska commercial salmon harvest by statistical region and species are presented in Table 9. Table 10 gives the projections by management region and species. These projections are composed of forecast harvests, and harvest projections (recent harvest averages, sometimes modified if additional information is available) for fisheries without formal forecasts. Coho salmon returns are not forecast in any region. Forecasts of chum salmon returns are available only for Prince William Sound. Several smaller pink salmon returns are not forecast. Major sockeye salmon runs in the Central and Western statistical regions are forecast; an important exception is the sockeye salmon fisheries in Kodiak. Despite these gaps, 89% of the 1986 salmon harvest of 127 million came from fisheries where formal forecasts are made.

The 1987 total commercial harvest projection is 94.1 million.

Species Outlook

Pink Salmon

57% of the 1987 statewide total harvest projection, or 53.8 million fish.

59.9% of the 1986 statewide total harvest, or 76.5 million fish.

A substantial decrease from the 76.5 million pink salmon harvested in 1986 to 53.8 million harvest anticipated in 1987 is expected. The pink salmon harvest is expected to increase to Prince William Sound and to decrease in other areas of the state.

Sockeye Salmon

23.9% of the 1987 statewide total harvest projection, or 22.5 million fish.

25.2% of the 1986 statewide total harvest projection, or 32.2 million fish.

The 1987 catch of sockeye salmon is expected to decrease from the 1986 harvest level, due to a substantially lower Bristol Bay forecasted sockeye harvest.

Chum Salmon

12.9% of the 1987 statewide total harvest projection, or 12.2 million fish.

9.6% of the 1986 statewide total harvest, or 12.3 million fish.

Table 9. Preliminary projections of 1987 Alaska commercial salmon harvests by statistical region and species[1].

STATISTICAL REGION	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeastern	242	1500	2800	26300	3800	34642
Central	83	11002	1454	27525	5668	45732
Western	233	9985	790	55	2695	13758
TOTAL ALASKA	558	22487	5044	53880	12163	94132

[1] Compiled 15 November 1986, catches in thousands of fish. The projected 1986 harvests were obtained by summing harvest forecasts (Table 8) and harvest projections for remaining fisheries. The latter based on recent catches.

[2] See Figure 3 for definition of statistical areas.

Table 10. Preliminary projections of 1987 Alaska commercial salmon harvests by management region and species[1].

Management Region	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeastern	242	1500	2800	26300	3800	34642
Central	159	15082	1094	18025	3468	37828
Arctic-Yukon-Kuskokwim	121	80	485	50	1555	2291
Westward	36	5825	665	9505	3340	19371
TOTAL ALASKA	558	22487	5044	53880	12163	94132

[1] Compiled 15 November 1986, catches in thousands of fish. The projected 1986 harvests were obtained by summing harvest forecasts (Table 8) and harvest projections for remaining fisheries. The latter based on recent catches.

[2] See Tables 4,5,6, and 7 for definition of management regions.

Coho Salmon

5.4% of the 1987 statewide total harvest projection, or 5.0 million fish.

4.9% of the 1986 statewide total harvest, or 6.3 million fish.

APPENDIX. FORECAST METHODS AND DISCUSSIONS

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1987 RETURN:

Southern Southeastern:	Point	Range
Return Estimate:	27.2 million	18.7 million - 35.7 million
Escapement Goal:	6.0 million	
Harvest Estimate:	21.2 million	12.7 million - 29.7 million
Northern Southeastern:		
Return Estimate:	9.7 million	6.6 million - 12.8 million
Escapement Goal:	4.6 million	
Harvest Estimate:	5.1 million	2.0 million - 8.2 million
Total Southeastern:		
Return Estimate:	36.9 million	27.9 million - 45.9 million
Escapement Goal:	10.6 million	
Harvest Estimate:	26.3 million	17.3 million - 35.3 million

FORECAST METHODS

Returns to the southern and northern areas of Southeastern Alaska are forecast separately because of differences in migration routes and run timing. The southern Southeastern forecast is the result of using multiple linear regression analysis on 22 years of data to forecast survival (return/spawner). Variables utilized in the regression analysis include: average minimum winter air temperatures in southern Southeastern, date of the coldest 15-day moving average over the same period, and a variable related to escapement sex ratios. The northern Southeastern forecast was prepared using the pre-emergent fry index, and an index of marine conditions in the year that the fry outmigrate.

DISCUSSION OF 1987 FORECAST

Southern Southeastern: The 1987 pink salmon return to southern Southeastern is not expected to exhibit the strength it has in recent years. The 1987 prediction was made with the handicap of having the two most important variables (escapement and winter temperatures) outside of the range of anything experienced since statehood. In fact, there are

several ways of comparing the winter conditions which indicate it was the most severe winter since local temperature keeping was initiated in 1949. The exceptional escapement index obtained in 1985 of 12.3 million (3 million higher than anything achieved since statehood) is responsible for keeping the expected 1987 return above disaster levels. It is very possible that the regression analysis utilized for the 1987 prediction over-estimated the influence of escapements and underestimated the influence of environmental conditions. Consequently, if there is an error in the 1987 prediction it is expected to be in the direction of over-estimating the return.

The distribution of the 1987 return will be similar to that which occurred in 1979 with a very poor return to District 101 and the overall run looking extremely weak until well into the season. Early marine studies conducted in Behm Canal during the spring of 1986 documented very low pink salmon fry abundance. If the run materializes as expected, the fishing time allowable in District 104 will have to be restricted relative to recent years. This should result in greater than average numbers of fish available for harvest in Districts 102, 105, 106, and 107. The majority of the 1987 catch is expected to come from District 103.

Northern Southeastern: The point estimate of 9.7 million represents a return per spawner of 1.1 which is below average for the recent 19 years. A severe cold snap in late November and early December had a severe impact on overwinter survival. Not only were temperatures at record low levels for over three weeks, there was virtually no snow cover during the period to help insulate the streams so freezing penetrated deeper than it would have with some snow. Once the cold period ended, the temperatures rose rapidly and precipitation was very heavy and the resulting scouring caused by large blocks of ice being swept out caused additional mortality. Pre-emergent fry values in March of 1986 were the lowest since 1981 reflecting the severity of the winter conditions.

Escapement levels in all districts were at or near the best since 1960 which should help mitigate some of the effects of the extreme cold because we will have some production from areas that normally do not have any spawning.

District 109 had 1.3 million escapement or 16% of the total for northern Southeastern but the raw fry index was just above average for the recent 20-year average. Red Bluff Bay had by far the best fry index in this district but it was well below the value for the past two years. Some levels of harvest are expected from this district.

District pre-emergent fry values for District 110 through 112 were all below the recent 20-year average. In District 110 the stream with the best fry index was Glen Creek which had a fry index that just exceeded the recent 10-year average. In District 111 fry values were all well below those experienced in the recent three years. District 112 had strong fry indexes in only three of the 22 study areas, Lake Florence, Clear River in Kelp Bay and Seal Bay in Tenakee Inlet. Escapements were

very strong in all three districts, however, and some harvest is also expected from these districts.

In District 113, escapements were strong as in the other districts but fry values were generally well below those for the last two returns. Peril Straits had escapements that were over 200 thousand below goal levels and the fry index was the lowest since 1981 so little harvest is expected from these systems. The outside coast, however, has very strong escapements totaling 2.3 million or 28% of the total northern Southeastern escapement. Fry values while not exceptional were not as bad as expected and harvestable surpluses are definitely expected from the outside coast.

District 114 had escapements in the parent year of 581 thousand but overwinter survival was poor and the resulting raw fry index of 56.1 was the lowest since 1976. Little harvestable surplus is expected in this district.

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FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1987 RETURN:

NATURAL PRODUCTION	Point	Range
Return Estimate:	8.2 million	5.7 million - 10.7 miilion
Escapement Goal:	1.5 million	
Harvest Estimate:	6.7 million	4.2 million - 9.2 million

SUPPLEMENTAL PRODUCTION

Cannery Creek Hatchery

Return Estimate:	2.2 million	1.3 million - 4.8 million
Brood Stock and Stream Escapement:	0.2 million	
Common Property Harvest Estimate:	2.0 million	1.1 million - 4.6 million

Main Bay Hatchery

Return Estimate:	0.5 million	0.3 million - 0.8 million
Brood Stock:	0.1 million	
Common Property Harvest Estimate:	0.4 million	0.2 million - 0.7 million

Prince William Sound Aquaculture Corporation, A.F.K. Hatchery

Return Estimate:	6.0 million	3.1 million - 8.9 million
Brood Stock:	0.2 million	
Hatchery Harvest:	1.6 million	
Common Property Harvest Estimate:	4.2 million	1.3 million - 7.1 million

Esther Island Hatchery

Return Estimate:	1.8 million	1.0 million - 2.7 million
Brood Stock:	0.3 million	
Hatchery Harvest:	0.0 million	
Common Property Harvest Estimate:	1.5 million	0.7 million - 2.7 million

Valdez Fisheries Development Association, Solomon Gulch Hatchery

Return Estimate:	2.7 million	2.2 million - 3.3 million
Brood Stock:	0.2 million	
Hatchery Harvest:	1.3 million	
Common Property Harvest Estimate:	1.2 million	1.0 million - 2.1 million

TOTAL SUPPLEMENTAL PRODUCTION

	Point	Range
Return Estimate:	13.2 million	
Brood Stock and Stream Escapement:	1.0 million	
Hatchery Harvest:	2.9 million	
Common Property Harvest Estimate:	9.3 million	

TOTAL AREA PRODUCTION

Return Estimate:	21.4 million	17.4 million - 25.4 million
Brood Stock and Hatchery Harvest:	5.4 million	
Harvest Estimate:	16.0 million	12.0 million - 20.0 million

FORECAST METHODS

Natural Production: The 1987 forecast is based on multiple regression analysis of odd-numbered brood years pre-emergent fry indices. March-April degree days that occurred during the brood year + one and the resultant adult total return. (NOTE: Degree days represent the average high air temperature for weather gathering stations in Prince William Sound minus 32 degrees. The daily differences were accumulated for the period 1 March to 30 April; the final tally is what is statistically related to the fry indices and adult returns). The 1985 brood year had an estimated escapement of 2.7 million fish; this escapement produced a pre-emergent fry index of 252 fry per square meter. This index represents a considerable reduction when compared to the recent six-year average that the Sound has experienced; this coupled with a lower than average environmental parameter leads to a lower overall production rate than has been recently experienced.

Supplemental Production: The estimated return of 13.2 million pink salmon back to Prince William Sound's hatcheries is the result of a fry release of nearly 255 million fed and unfed fish. This represents an increase of some 35 million over 1986 releases. Fry to adult survival rates were estimated by hatchery and F.R.E.D. personnel and varied from 1.4% to 5.4%. The mean estimated survival rate for the fed fry was 5.2% while that of the unfed fry was 2.7%. Overall survival rates for the group as a whole ranged from 0.8% to 7.9%.

DISCUSSION OF THE 1987 FORECAST

Natural Production: The forecast return of 8.2 million fish for the 1987 season will allow for a commercial harvest of 6.7 million fish when the desired escapement of 1.5 million fish has been taken into consideration. The forecasted harvest range is 4.2 to 9.2 million. Even though the overall production rate is expected to be lower it is expected that there will be harvestable surpluses in all districts due to the fact that the brood year escapement was good in all districts.

However, special closures may be necessary if weaknesses are detected in escapements.

Supplemental Production: As previously stated the 1986 spring fry release represented a considerable increase over the previous year. If mean estimated fry to adult survival rates are reasonably correct and the wild stocks come back as predicted then the hatchery return will contribute a larger portion to the common property fishery for the second year in a row.

Hatchery returns will be available for either hatchery or common property fishery harvest from early July to late August.

FORECAST AREA; Prince William Sound

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1987 RETURN;

NATURAL PRODUCTION	Point	Range
Return Estimate:	1,300,000	900,000 to 1,700,000
Escapement Goal:	250,000	
Harvest Estimate:	1,050,000	650,000 to 1,450,000
SUPPLEMENTAL PRODUCTION		
Main Bay Hatchery		
Return Estimate:	160,000	112,000 to 208,000
Brood Stock:	75,000	
Common Property Harvest Estimate:	85,000	37,000 to 133,000
Prince William Sound Aquacuture Corporation, A.F.K. Hatchery		
Return Estimate:	145,000	83,000 to 248,000
Brood Stock:	29,000	
Hatchery Harvest:	0	
Common Property Harvest Estimate:	116,000	54,000 to 219,000
Esther Island Hatchery		
Return Estimate:	84,000	48,000 to 145,000
Brood Stock:	59,000	
Hatchery Harvest:	0	
Common Property Harvest Estimate:	25,000	0 to 86,000
TOTAL SUPPLEMENTAL PRODUCTION		
Return Estimate:	229,000	
Brood Stock:	88,000	
Hatchery Harvest:	0	
Common Property Harvest Estimate:	141,000	
TOTAL AREA PRODUCTION		
Return Estimate:	1,689,000	1,274,000 to 2,103,000
Brood Stock and Hatchery Harvest:	413,000	
Common Property Harvest Estimate:	1,276,000	862,000 to 1,690,000

FORECAST METHODS

Natural Production: The 1987 forecast involved the use of pre-emergent fry indices, air temperature data, total brood year returns, average percent contributions to brood year returns by age class and age class ratio comparisons by brood year.

The forecasted return is expected to be comprised of 25,000 3-year-old, 980,000 4-year-old, 290,000 5-year-old, and some 5,000 6-year-old fish. The projected return of 4-year-old fish is quite high when compared to the 1983 brood year production of only 37,000 3-year-old fish. However, it is felt that maturity schedules have been held back as was witnessed in the 1986 return when the four-year-old prediction was far lower than finally realized. It is believed that the same or similar marine conditions exist for 1987's return as did for the 1986 return. Another factor taken into consideration for the large four-year-old forecast was the large 1985 pink salmon return to the Sound; there has been a definite relationship between large pink salmon returns and subsequent large chum salmon returns two years later. Prior to the large 1986 chum salmon return there had been an excellent relationship between three-year-old returns in one year and four-year-old returns the following year; it was this relationship that led to the relatively small four-year-old prediction for the 1986 return. However, after reviewing the data it was decided that marine maturity schedules are the deciding factor for the 1983 brood year as opposed to estuarine mortality factors.

Supplemental Production: Hatchery forecasts are based on average or estimated fry to adult survival rates and average brood year contributions by age class percentages. This year's predicted fry to adult survival rates ranged from 1.0 to 2.0%.

DISCUSSION OF THE 1987 FORECAST

Natural Production: The vast majority of the harvestable chum salmon are expected to be available along the northern portion of the Sound. Both early, middle, and late portions of the run should contribute to the harvest.

Supplemental Production: Main Bay and early Esther Island hatchery stocks will be available to the Coghill District drift gillnet fleet during regular openings of the Coghill sockeye salmon fishery. The Main Bay stocks will also be available to the Main Bay subdistrict fishery. Later stocks will be available to the purse seine fleet and Coghill's drift gillnet fishery.

Michael L. McCurdy
Research Project Leader
Cordova

FORECAST AREA: Prince William Sound

SPECIES: Sockeye Salmon, Coghill River

PRELIMINARY FORECAST OF 1987 RETURN:

NATURAL PRODUCTION	Point	Range
Return Estimate:	409,000	307,000 to 511,000
Escapement Goal:	50,000	
Harvest Estimate:	359,000	257,000 to 461,000

FORECAST METHODS

The 1987 preliminary forecast was based on brood production data from brood years 1969 to 1982. The forecast includes the four major age classes that return to the Coghill River system; they are 1.2's, 1.3's, 2.2's, and 2.3's. Forecast analysis included linear regression analysis between brood year siblings by freshwater age classes, annual contributions to brood year production based on brood year escapement size and average return per spawner, and average 1-Freshwater to 2-Freshwater brood year production ratios. On the average, the above age classes comprise at least 95% of returns to the Coghill River District.

DISCUSSION OF THE 1987 FORECAST

The majority of the 1987 return will be from an escapement of 180,314 fish; this escapement occurred in 1982 and is the largest recorded since the Coghill River weir has been in operation beginning in 1974. It is estimated that this brood year will produce a total of 352,000 5-year-old fish of both the 1- and 2-Freshwater age classes. The remainder of the anticipated return will be from the 1981 and 1983 brood years and will comprise 36,000 4- and 6-year-old fish. The 6-year-old component will be from a brood year escapement of 156,000 fish which has to date produced a return of 449,000 fish; the 4-year-old component will be from a brood escapement of 38,783 fish.

If the 1987 return comes in as projected the harvest will be some 93,000 fish above the harvest of 266,000 fish. If a weakness does occur in the return it could be due to the lack of 5-year-old fish (1-Freshwater, 3-Ocean) from the 1982 brood year. The reason for this speculation is that the Coghill Lake system has experienced three successive large escapements averaging 159,000 fish (1980 to 1982) and it is not known whether or not the high production rates from the first two escapements will be sustained by the third and largest escapement; the inability to sustain these high rates of production is based on the freshwater rearing capacity of the Coghill system.

Michael L. McCurdy
Research Project Leader
Cordova

FORECAST AREA: Prince William Sound/Copper River

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1987 RETURN:

NATURAL PRODUCTION	Point	Range
Return Estimate:	1,559,000	1,247,600 to 1,871,400
Escapement Goal:	681,300	
Harvest Estimate:	878,200	702,560 to 1,053,840
SUPPLEMENTAL PRODUCTION		
Gulkana Hatchery		
Return Estimate	99,000	79,200 to 118,800
Brood Stock and Stream Escapement:	39,600	
Harvest Estimate:	59,400	47,500 to 71,300
TOTAL PRODUCTION		
Return Estimate:	1,658,500	1,326,800 to 1,990,200
Escapement and Brood Stock:	720,900	
Harvest Estimate:	937,600	750,060 to 1,125,140

FORECAST METHODS

Natural Production: The 1987 sockeye salmon forecast utilized historical return per spawner data from the five most similar spawning populations and parent year escapement weighted age class (4-, 5-, and 6-year-olds) for the Copper River Delta and Upper Copper River independently. The 1987 predicted return is influenced heavily by the 1982 and 1983 brood years for the Copper River Delta and the Upper Copper River.

Supplemental Production: The 1987 supplemental return will be the result of production from Gulkana Hatchery. Brood years 1982 and 1983 using F.R.E.D. Division standard survival assumptions should produce an adult return of 99,000. A harvest level of 60% would contribute 59,400 salmon to the catch.

DISCUSSION OF THE 1987 FORECAST

Natural Production: Continued mild winter conditions, particularly on the Copper River Delta during the freshwater life history stages of the

age groups represented in the 1987 return, should produce a near-average (but below) return per spawner contribution from the above average parent year escapements of 1981 and 1983; however, major flooding in August of 1981 may have had a moderate impact on survival. Upper Copper River escapements were above average in all three years, thus generally mild conditions and good distribution should yield near average returns. The parent year escapement is one of the highest in the available data base thus few similar prediction points are available. The forecast will error on the conservative side if environmenta conditions continue to produce above average survival rates; however, high fry densities will bring down the return per spawner rate.

Supplemental Production: Facility production data and conditions suggest that even a wide variation in survival from the expected would not significantly alter the 1987 sockeye salmon return; however, in future years with the significant increases in fry production that have occurred since the 1982 and 1983 brood years, production data and variations will become increasingly important.

SPECIES: Chinook Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN;

NATURAL PRODUCTION	Point	Range
Return Estimate:	47,433	37,900 to 56,900
Escapement Goal:	15,000	
Harvest Estimate:	32,433	25,900 to 38,900

FORECAST METHODS

The 1987 chinook salmon forecast utilized historical aerial index and age composition data from the 4-, 5-, 6-, and 7-year-old age classes. Weighted index figures are combined to create a single index of abundance figure which for lack of better data base is compared to the historical average escapement index. The expected return is then a return per spawner calculation which does not consider density, climate conditions, or distribution of spawners.

DISCUSSION OF THE 1987 FORECAST

During the past 8-10 years, chinook salmon returns to the Copper River have been consistently above average and have established several of the top catches on record while escapements have also been maintained at high levels. Only a failure of the 1981 or 1982 brood years or significant extra production of the 1983 brood years could seriously affect the forecasted return. No climate condition or other event is

believed to have impacted any of the brood years involved. A chinook salmon harvest of the 32,400 fish magnitude appears to be a solid estimate.

Kenneth Roberson
Research Biologist
Glennallen

FORECAST AREA: Upper Cook Inlet

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1987 RETURN:

NATURAL PRODUCTION	Point	Range
Return Estimate:	5.8 million	4.8 million to 6.8 million
Escapement Goal:	1.0 million	
Harvest Estimate:	4.8 million	3.8 million to 5.8 million

FORECAST METHODS

The major sockeye salmon systems in Upper Cook Inlet are the Kenai, Kasilof, Susitna, Crescent, Chakachatna/McArthur, Big Rivers, and Fish Creek.

Historical data on total sockeye salmon return are available for the first four systems noted and these data form the basis of the forecast. Escapement-return relationships by system provide estimates of total production from each brood year escapement. Average marine maturity schedules were then applied to estimate the numbers of adult salmon returning each year.

DISCUSSION OF THE 1987 FORECAST

The total return of sockeye salmon to Upper Cook Inlet is estimated to be 5.8 million in 1987. Desired escapement levels to the four major river systems total one million, providing an anticipated harvestable surplus of 4.8 million fish. Estimated returns to the Kenai River are 3.5 million, to the Kasilof River are 1.2 million, to the Susitna River are 960,000, and to the Crescent River are 127,000 fish.

In recent years, the forecast has proved to be fairly accurate relative to the total return, as opposed to return by individual system. In the previous four years, since the inception of the program, the actual return has averaged within 8% of the forecast with a range of 3-14%. However, it is suspected that the 1987 total return may exceed the point forecast by a considerable margin if marine survival rates for sockeye salmon leaving the Kasilof River drainage remain at the same level as previous years. Based on smolt information, the return to the Kasilof River could exceed 2.0 million fish, well above the forecasted 1.2 million fish which is based on spawner/return relationships.

Kenneth E. Tarbox
Research Project Leader
Upper Cook Inlet

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN[1]:

NATURAL PRODUCTION	Point	Range
Total Return:	6.8 million	5.7 million - 7.8 million
Escapement Goal:	2.0 million	
Harvest Estimate:	4.8 million	3.7 million - 5.8 million
SUPPLEMENTAL PRODUCTION		
Total Return:	1.2 million	.7 million - 1.7 million
Brood Stock:	.20 million	
Harvest Estimate:	1.0 million	.5 million - 1.5 million
TOTAL AREA PRODUCTION		
Return Estimate:	8.0 million	6.6 million - 9.5 million
Brood Stock and Escapement:	2.20 million	
Harvest Estimate:	5.8 million	4.4 million - 7.3 million

1 Hatchery production forecast is for Kitoi Bay Hatchery and was prepared by Roger Blackett. See Afognak District for additional discussion. All numerical values represent numbers of pink salmon.

FORECAST METHODS

The 1987 pink salmon forecast return to the Kodiak Management area was determined as follows. A point estimate for the total management area return was calculated from a multiple linear regression analysis of the past 21 years pre-emergent data. Variables used in the analysis were the indexed live fry densities and the anomalies of average March and April ambient air temperatures taken in Kodiak.

DISCUSSION OF THE 1987 FORECAST

Pre-emergent fry sampling this spring (1986) indicated poor to good overwinter survival from the excellent brood year escapement of 3.2 million pink salmon. Sampling resulted in an unweighted live fry index of 163.40 live fry/m^2, which was above average.

Distribution of the brood year escapement resulted in 64% of the fish entering the pre-emergent index streams. Sampling conditions during March 1986 were generally very good on Kodiak and Afognak Islands. Sampling on the mainland was once again prevented by freezing temperatures during late March and early April. Volcanic ash from St. Augustine was also a factor as it prevented operation of the turbine helicopter.

Flooding and scouring, due to high rainfall, of the major westside pink salmon streams, in addition to cold April air temperatures were the factors responsible for the forecast being lower than that based solely on the high percentage escapements and average live fry densities.

A breakdown of the expected returns by major geographical districts is summarized below. All district harvest projections assume desired escapement goals will be met.

Afognak District: The pre-emergent fry index for this district is about average. A total of 400,000 pink salmon are expected to return. The desired escapement level is 150,000 pink salmon leaving 250,000 pink salmon available for harvesting.

Afognak District Supplemental Production: Kitoi Bay Hatchery total return point estimate is 1.2 million pink salmon from a release of 83.5 million emergent fry and 14.3 million reared pink salmon fry. Approximately 150,000 pink salmon are required for escapement and brood stock leaving approximately 1.15 million pinks available for harvesting.

Westside District: Overall live fry densities for the district are some of the lowest on record. Severe scouring in Terror, Uganik, Zachar, and the upper portion of Uyak Rivers appears to be the main reason for these low fry densities. As a result of the low fry densities combined with a cold, late spring approximately 1.9 million pink salmon are expected to return to this district. The desired escapement goal is 400,000 pink salmon leaving an estimated 1.5 million pink salmon available for harvesting.

Alitak District: Overall live fry densities for this district are below average. Two sample sites on lower Humpy River were not done due to ice jams. All streams in this district showed signs of scouring. 1.2 million pink salmon are expected to return. The desired escapement goal is 400,000 pink salmon leaving approximately 800,000 pink salmon available for harvesting.

General District: The overall live fry index for the district is one of the highest on record. Most streams sampled showed signs of scouring; however, live fry densities were good along with the percentage of the sample sites with fry. A late-cold spring this year may affect early marine survival, resulting in a lower than expected return from an above average live fry index. 2.6 million pink salmon are expected to return to this district. The desired escapement goal is 650,000 pink salmon leaving approximately 2.0 million pink salmon available for harvesting.

Mainland District: Only Alinchak River was sampled. Sampling conditions at the time were poor. No additional sampling was done due to freezing weather and volcanic eruptions. Based on the brood year escapement and the overwintering success of pink fry on Kodiak and Afognak Islands, approximately 700,000 pink salmon are expected to return to this district. The desired escapement goal is 400,000 pink salmon leaving approximately 300,000 pink salmon available for harvesting.

David Prokopowich
Assistant Area Management Biologist
Kodiak Management Area

FORECAST AREA: Chignik

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN:

EARLY RUN (Black Lake Stock)	Point	80% Prediction Range
Return Estimate:	1.80 million	1.20 to 2.30 million
Escapement Goal:	400,000	
Harvest Estimate:	1.40 million	.90 to 1.90 million
LATE RUN (Chignik Lake Stock)		
Return Estimate:	1.30 million	1.10 to 1.50 million
Escapement Goal:	250,000	
Harvest Estimate:	1.05 million	.85 to 1.25 million
TOTAL CHIGNIK		
Return Estimate:	3.10 million	2.47 to 3.73 million
Escapement Goal:	650,000	
Harvest Estimate:	2.45 million	1.82 to 3.08 million

FORECAST METHODS

Point estimates given above are sums of the predicted returns of 3-ocean and 2-ocean age sockeye salmon in the respective runs.

A multiple linear regression equation predicts the return of 3-ocean age fish in the early run from data on the return of 1.2 age fish in the previous year, mean length of 1.2 males in the previous year, and size of the early run escapement 5 years earlier. The late run forecast was derived by using the average return per spawner based on the past 26 years of observed late run returns.

DISCUSION OF THE 1987 FORECAST

Early Run

The total point return estimate of 1.80 million for the early run falls well within the range of past years' returns. The average return from 1966 to 1985 equals 1.08 million with a range of 312,000 (1975) to the high experienced in 1984 of 3.2 million.

The parent year (1982) escapement of 616,000 for the 1987 return is the second highest escapement since 1954. Based on past years' return performance when early run sockeye salmon escapement counts have greatly exceeded the desired escpament goal of 400,000, the resulting return 5 years later, usually falls on the lower end of the range for that year's forecast. This is very difficult to quantify, however taking this into consideration and applying it to this year's forecast may result in the actual return coming in on the lower end of the forecast range.

Late Run

The 1987 preliminary forecast was developed by using average return/spawner based on the past 26 years of observed returns. This method of forecasting produces a lot of variability between the forecast and the actual return. The 1987 forecast midpoint estimation of 1.3 million is slightly above the average (1.2 million) of the observed returns for the years 1976-1985. It is anticipated that the actual return should fall within the prediction range given.

Peter Probasco
Area Management Biologist
Chignik Area

Greg Ruggerone
Fisheries Research Institute
University of Washington - Seattle

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN:

	Point	Range
Total Return:	16.1 million	1.7 million - 39.2 million
Escapement Goal:	9.7 million	
Projected Harvest:	8.7 million	0.0 million - 29.4 million

Forecasted returns to individual river systems are as follows: 2.7 million for Kvichak, 0.3 million for Branch, 2.5 milion for Naknek, 4.9 million for Egegik, 1.8 million for Ugashik, 2.0 million for Wood, 0.5 million for Igushik, 0.9 million for Nuyakuk, and 0.4 million for Togiak. Since returns to Kvichak are expected to be less than the escapement goal (5.0 million), the sum of individual escapement goals and harvests is greater than the total forecasted return..

FORECAST METHODS

The 1987 Bristol Bay sockeye salmon forecast is the weighted mean of the results of two independent methods: Standard ADFG (ADFG) and Japanese Research Vessel Catches (JRVC). The ADFG method is used to produce individual forecast, by major age-class, for each river system. ADFG predictions are calculated by averaging results of three linear regression models which use either spawner-recruit, sibling, or smolt data. The JRVC method is used to produce a forecast, by ocean age, for all of Bristol Bay. JRVC predictions are calculated from multiple linear regression models which use data collected by Japanese research vessels fishing south of the Aleutian Islands during July (i.e., geometric mean catch per unit of effort and mean length of immature sockeye salmon) along with mean June Cold Bay air temperatures for the last one or two year(s) (for two- and three-ocean returns, respectively) these salmon remained at sea.

Standard errors and 80% confidence limits for ADFG and JRVC estimates were calculated using linear regression analysis to describe the relationship between past forecasts (independent variable) and actual returns (dependent variable) for the last nine years, 1978-1986. The weighting factor used to combine estimates for the pooled forecast was the inverse of the variance (squared standard error) of each estimate. A detailed critique and description of methods and each age by system forecast, as well as any modifications of the preliminary forecast, will be included within an ADF&G Informational Leaflet to be published prior to the fishing season.

The two forecasting methods produced the following results in millions of sockeye salmon:

Forecast Method	Two-Ocean Return	Two-Ocean Std. Error	Three-Ocean Return	Three-Ocean Std. Error	Total Return	Total 80% Confidence Interval
ADFG	8.5	11.2	6.8	3.5	15.3	1.9 to 34.4
JRVC	9.6	14.9	7.8	4.6	17.5	1.4 to 44.6
Weighted Mean	8.9	13.2	7.2	4.1	16.1	1.7 to 39.2

DISCUSSION OF THE 1987 FORECAST

Although smolt information was available for six river systems, forecasts using this data could only be prepared for Kvichak (fall age classes), Naknek 4_2 and 5_3 age classes), Egegik (4_2 and 5_3 age classes), and Wood (all age classels) River systems, since a minimum of three years of smolt estimates and subsequent adult returns are needed to calculate the linear regression equations used for predictions. While too little data was available for any regression analyses of Ugashik and Nuyakuk River system data, the large number of smolt estimated to have been produced by sockeye salmon spawning during 1981, 1982, and 1983 suggested that returns to these two systems could be at least twice as great as those indicated by the pre-season forecast.

A total return of 16.1 million sockeye salmon would be 55% (19.3 million) less than the most recent 10-year, 1977-1986, mean (35.4 million, range 10.7-66.3 million), but would be similar to the previous 10-year 1967-1976, mean (16.6 million, range 3.5-45.0 million). Spawning escapements producing returns expected in 1987 were generally less than those which produced the very large returns which occurred during 1978-1986. Environmental conditions, as indicated by June Cold Bay air temperatures, may also have become less favorable for sockeye salmon returning in 1987. Weighted mean air temperatures during the years that the 1987 sockeye salmon returns were at sea were warmer than average for sockeye salmon that returned to spawn during 1978-1985, but were cooler than average for sockeye salmon that returned in 1986.

Stephen M. Fried

and

Henry J. Yuen
Research Biologists
Anchorage

FORECAST AREA: Bristol Bay, Togiak District

SPECIES: Chinook Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN:

	Point	Range
Return Estimate:	38,000	10,000 to 70,000
Escapement Goal:	15,000	
Projected Harvest:	23,000	0 to 55,000

FORECAST METHODS

The 1987 Togiak District chinook salmon forecast was based upon the relationship between returns of sibling age classes (i.e., age classes produced from the same spawning escapement). Standard linear regression techniques were used to estimate returns and 80% confidence intervals (ranges) for each major age class. These results were summed to provide the total return estimate.

DISCUSSION OF THE 1987 FORECAST

The 1987 Togiak District chinook salmon forecast of 29,000 is 43% less than the 1973-1986 average. Age 6_2 (31%) and age 5_2 (31%) are expected to dominate the return.

R. Eric Minard
Research Biologist
Dillingham

FORECAST AREA: Bristol Bay, Nushagak District

SPECIES: Chinook Salmon

PRELIMINARY FORECAST OF THE 1987 RETURN:

	Point	Range
Return Estimate:	133,000	90,000 to 126,000
Escapement Goal:	75,000	
Projected Harvest:	58,000	15,000 to 101,000

FORECAST METHOD

The 1987 Nushagak District chinook salmon forecast was based upon the relationship between returns of sibling age classes (i.e., age classes produced from the same spawning escapement). Standard linear regression techniques were used to estimate returns and 80% confidence intervals (ranges) for each major age class. These results were summed to provide the total return estimate.

DISCUSSION OF THE 1987 FORECAST

The 1987 Nushagak District chinook salmon forecast of 133,000 is 52% less than the average return since 1973. Age 6_2 and 5_2 returns are expected to contribute 54% and 27%, respectively. The projected harvest of 58,000 is also down from recent years.

R. Eric Minard
Research Biologist
Dillingham

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